

132407-3

IN THE CLAIMS:

1-25. (canceled)

26. (currently amended) An electroless plating process for forming a hard particle coating onto a hydroelectric turbine component, comprising:

dispersing hard particles and additives in a solution;

forming a metal ion bath in the solution comprising a metal sulfate solution, a hypophosphite solution, and deionized water, wherein the additives are effective to form oxides, borides, nitrides, carbides, phosphides, carbonitrides, oxynitrides, and mixtures thereof with the metal ion;

heating the bath to a temperature of about 80°C to about 95°C;

submerging and rotating the hydroelectric turbine component in the bath to plate the hydroelectric turbine component with a coating of the hard particles in a metal matrix;

removing the hydroelectric turbine component from the bath; and

heating the hydroelectric turbine component in a furnace to a temperature of about 300°C to about 500°C, wherein the coating has a Mohs hardness greater than 7 and nanoparticles comprising the metal and the additive are formed in situ.

27. (original) The electroless plating process of Claim 26, wherein the hard particles are spaced apart at an average distance equal to or less than 10 microns.

28. (original) The electroless plating process of Claim 26, wherein the metal ion bath has a concentration of metal ions of about 5.5 to about 6.3 grams per liter of bath solution.

29. (original) The electroless plating process of Claim 26, further comprising periodically replenishing the bath so as to maintain the metal ion concentration at about 5.5 to about 6.3 grams per liter.

30-31. (canceled)

132407-3

32. (original) The electroless plating process of Claim 26, wherein the hard particle coating has a volume fraction of hard particles greater than 25 percent.

33. (original) The electroless plating process of Claim 26, wherein the hard particles have a nominal diameter of 0.25 microns to 12 microns and are spaced apart in the hard particle coating at a distance equal to or less than about 10 microns.

34. (original) The electroless plating process of Claim 26, wherein the coating has an average thickness greater than 25 microns.

35. (currently amended) An electroplating process for forming a hard particle composite coating onto a hydroelectric turbine component, comprising:

forming a metal ion bath comprising a metal sulfate solution and deionized water;

dispersing hard particles and ~~nanoparticles-additives~~ in the metal ion bath, wherein the ~~nanoparticles-additives comprise are selected to form~~ carbides, borides, nitrides, or oxides with at least one metal selected from a group of metals consisting of Al, Si, W, Cr, Ti, Nb, Zr, Hf, Ta, and Mo the metal ion;

submerging and rotating the hydroelectric turbine component in the bath to plate the hydroelectric turbine component;

fixturing the component as the cathode;

passing current through the bath and the component to form the hard particle coating; and

removing the hydroelectric turbine component from the bath and subjecting the hydroelectric turbine to a heat treatment effective to form nanoparticles in situ of the metal ion and the additive.

36. (original) The process according to Claim 35, wherein the hard particles are spaced apart at an average distance equal to or less than 10 microns.

37. (original) The electroplating process of Claim 35, wherein the metal ion bath has a concentration of metal ions of about 5.5 to about 6.3 grams per liter of bath solution.

132407-3

38. (original) The electroplating process of Claim 35, further comprising periodically replenishing the bath so as to maintain the metal ion concentration at about 5.5 to about 6.3 grams per liter of bath solution.

39-40. (canceled)

41. (original) The electroplating process of Claim 35, wherein the hard particle coating has a volume fraction of hard particles greater than 25 percent.

42. (original) The electroplating process of Claim 35, wherein the hard particles have a nominal diameter of 0.25 microns to 12 microns and are spaced apart in the composite hard particle coating at a distance less than 10 microns.

43. (original) The electroplating process of Claim 35, wherein the substantially continuous film has an average thickness greater than 25 microns.

44. (original) The electroplating process of Claim 35, wherein the hard particles have a Mohs hardness of greater than 7.

45. (currently amended) A process for forming a hard particle coating onto a hydroturbine component, comprising:

submerging the hydroelectric turbine component into an aqueous plating bath at a temperature of about 80°C to about 95°C and for a period of time effective to form a hard particle coating on the hydroelectric turbine component, wherein the plating bath comprises hard particles and additives suspended therein, wherein the additives are selected to form carbides, borides, nitrides, oxides, carbonitrides, and oxynitrides;

removing the hydroelectric turbine component from the bath; and

heating the hydroelectric turbine component in a furnace to a temperature of about 300°C to about 500°C and forming nanoparticles in situ of the additive and the metal ion.

46. (original) The process of Claim 45, wherein the aqueous plating bath comprises a nickel salt, a cobalt salt, an iron salt, or combinations comprising at least one of the foregoing salts.

132407-3

47. (original) The process of Claim 45, further comprising adding soluble additives that contain phosphorous or boron to the aqueous plating bath.

48. (original) The process of Claim 45, further comprising forming nanoparticles in the hard particle coating, wherein the nanoparticles comprise carbides, borides, nitrides, or oxides with at least one metal selected from a group of metals consisting of Al, Si, W, Cr, Ti, Nb, Zr, Hf, Ta, and Mo.

49. (original) The process of Claim 45, wherein the hard particle coating has a volume fraction of hard particles greater than 25 percent based on the total volume of the coating.

50. (original) The process of Claim 45, wherein the hard particles have a nominal diameter of 0.25 microns to 12 microns and are spaced apart in the hard particle coating at an average distance less than or equal to 10 microns.

51. (original) The process of Claim 45, wherein the coating has an average thickness greater than 25 microns.

52. (original) The process of Claim 45, wherein the hard particles have a Mohs hardness greater than 7.

53-54. (canceled )